Remarks

The Office Action mailed December 12, 2003 has been carefully considered. After such consideration, Claims 9, 14, 16, 17, 21, 22, 49, 54, 55, 56, 60, and 61 have been editorially amended. To clarify the record, Applicant notes that Claims 26-41 were canceled without prejudice to the subject matter therein as being directed to a non-elected invention in the response dated June 25, 2002. As such, Claims 1-25 and 42-63 remain in the case with none of the claims being allowed. Reconsideration and allowance in view of the following is respectfully requested.

Applicants respectfully submit that the present amendment complies with 37 CFR 1.116 as the claims, if amended as proposed, present no new issues requiring further consideration and search, and thus the amendment places the case in condition for allowance or in better condition for appeal. Applicants respectfully submit that the entry of the present amendment is proper.

The Office Action had rejected Claims 1-25 and 32-63 [sic] under 35 U.S.C. 103(a) as being unpatentable over DE 19634314 (DE '314). As the only remaining claims in the case, Applicant respectfully submits that the rejection may be directed at only Claims 1-25 and 42-63. Applicant traverses the 35 U.S.C. 103(a) rejection of Claims 1-25 and 42-63 in view of DE '314.

In making the rejection, the Office Action states:

> DE '314 discloses the invention substantially as claimed. DE '314 discloses at Fig 2 and accompanying discussion a tool piece comprising:
>
> a first hard metal body (26);
>
> an addition body (25) bonded to the first hard metal body through a mating surface (23) by a high pressure (50×10^7 Pa, col. 5. line 23-32).

This interpretation appears to be based on an out of context translation of DE '314. The passage at col. 5. line 23-32 of DE '314 corresponds to the second paragraph on page 5 the of the English translation of DE '314 that states:

> As shown in Fig. 1, a single compound component 20 can be created from two parts 21 and 22 with a common joining surface 23 which is uneven. For producing said compound component, a first mix followed by a second mix are loosely layered by filling a compactor accordingly, where the mixes differ with regard to their material composition and are used in granular form. With an exceedingly wide grain size spectrum the grain size ranges between 60 µm and 250 µm. Subsequently, the two mixes are compacted into a uniform green compact by lowering a pressure die under a pressure of up to 50×10^7, followed by finally sintering said green compact under normal sintering conditions. An uneven interface 23 firmly bonded on the joining surface 23 is thus obtained. (Emphasis Added)

The pressure disclosed in this paragraph relates to the compacting pressure used for making a single green compact – not the subsequent sintering conditions. This compact is subsequently sintered under normal sintering conditions. A reading of the entire English translation of DE '314 shows that it neither discloses nor suggests that for which it was cited.

In contrast, independent Claims 1, 15, and 25 of the present application are directed to a tool piece comprising, in combination with additional recited features, (a) a hardmetal body; (b) an additional body contiguously contacting the hardmetal body; (c) a substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, between the hardmetal body and the additional body; and (d) a mating surface between the hardmetal body and the additional body including mating features. In independent Claim 1, the mating features are macro features

having a macro feature area to a perturbated macro feature area ratio comprising slightly greater than about 1:2 to about 1:50. In independent Claim 15, the mating features are micro features, and macro features and the macro features have a macro feature area to a perturbated macro feature area ratio comprising slightly greater than about 1:2 to about 1:25. In independent Claim 25, the mating features are micro features and macro features, and the macro feature area to a perturbated macro feature area ratio comprising slightly greater than about 1:2 to about 1:50.

Among other things, the substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, of the invention of Claims 1-25 and 42-63 results in a tool piece that is different from that disclosed DE '314. As demonstrated by the information in Table 2 of the specification reproduced below, the binder of a first body migrates into a second body to result in a continuously varying binder level (see e.g., Prior Art 3) and a homogenized binder level (see e.g., Prior Art 4) when sintered under normal sintering conditions. In contrast and as demonstrated by the information in Table 3 of the specification reproduced below, the tool piece of the present invention includes a substantially discontinuous gradient-free boundary when formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure.

As DE '314 neither discloses nor suggests the invention of Claims 1-25 and 42-63 for the reason stated above, the 35 U.S.C. 103(a) rejection is improper. Thus, the 35 U.S.C. 103(a) rejection of Claims 1-25 and 42-63, being improper, should be withdrawn.

Table 2 Comparison of the Prior Art			
Prior Art 1			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	10.9	5.95	Binder migrated into this body from the second
Binder Chemistry	Cobalt	Cobalt	
Particle Size	6.7 μm	7.8 μm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	9.6	11.4	Binder migrated from this body into the first
Binder Chemistry	Cobalt	Cobalt	
Particle Size	2.8 μm	2.8 μm	
Prior Art 2			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	2.5	4.5	Binder migrated into this body from the second
Binder Chemistry	Cobalt	Cobalt	
Particle Size	1-5 μm	1-5 μm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	7.2	6.0	Binder migrated from this body into the first
Binder Chemistry	Cobalt	Cobalt	
Particle Size	1-12 μm	1-12 μm	
Prior Art 3			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	12	~9	After an about 9 hour sintering, the binder level homogenized
Binder Chemistry	Cobalt	Cobalt	
Particle Size	0.5-10 μm	0.5-10 μm	
	2nd Green Body	2nd Hardmetal Body	
Wt.% Binder	6	~9	
Binder Chemistry	Cobalt	Cobalt	
Particle Size	0.5-10 μm	0.5-10 μm	
Prior Art 4			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	12	~11	After about 45 minutes at about 2100°F a continuously varying binder level resulted
Binder Chemistry	Cobalt	Cobalt	
Particle Size	0.5-10 μm	0.5-10 μm	
	2nd Green Body	2nd Hardmetal Body	
Wt.% Binder	6	6	
Binder Chemistry	Cobalt	Cobalt	
Particle Size	0.5-10 μm	0.5-10 μm	

TABLE 3 SAMPLES MADE BY THE PRESENT INVENTION			
Sample A (different binder chemistry)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	14	14	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	2.8 %Nickel 11.2 %Cobalt	2.8 %Nickel 11.2 %Cobalt	
Particle Size	~3.2μm	~2.5μm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	14	14	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~2.5μm	
Sample B(different green bodies)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	6	6	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~2.5μm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	8	8	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~5.2μm	~4μm	
Sample C(different sintered hardmetal bodies)			
	1st Hardmetal Body	1st Hardmetal Body	Comments
Wt.% Binder	6	6	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~3.2μm	
	2nd Hardmetal Body	2nd Hardmetal Body	Comments
Wt.% Binder	8	8	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~5.4μm	~5.4μm	
Sample D(metal body and sintered hard metal body)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	6	6	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~3.3μm	
	Metal Body	Metal Body	Comments
Wt.% Binder	*4340 steel*		The interface had substantially no porosity, substantially no intermetallics and substantially no porosity
Binder Chemistry			
Particle Size			
Sample E(different green bodies)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	13	13	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~2.5μm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	16	16	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2μm	~2.5μm	
Sample F(different green bodies)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	13	13	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2	~2.5	

TABLE 3 SAMPLES MADE BY THE PRESENT INVENTION			
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	16	16	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~5.4µm	~4.8µm	
Sample G(different green bodies)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	0	0	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry			
Particle Size	0.4µm	0.3µm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	13	13	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2µm	~2.5µm	
Sample H(different green bodies)			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	10	10	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~1.0µm	~1µm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	8	8	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	5.2µm	~4.2µm	
Sample I(different green bodies) – Roc temp 1400C			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	14	14	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2µm	~3.5µm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	14	14	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~5.2µm	~5.4µm	
Sample J(different green bodies) – Roc temp 1400C			
	1st Green Body	1st Hardmetal Body	Comments
Wt.% Binder	6	7.2	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	~3.2µm	~3.4µm	
	2nd Green Body	2nd Hardmetal Body	Comments
Wt.% Binder	8	7.2	The hardmetal had an A00, B00, C00 porosity rating
Binder Chemistry	Co	Co	
Particle Size	5.2µm	~5.3µm	

The Applicant submits that by this amendment, they have placed Claims 1-25 and 42-63 of the case in condition for immediate allowance, and such action is respectfully requested. However, if any issue remains unresolved, Applicant's attorney would welcome the opportunity for a telephone interview to expedite allowance and issue.

Respectfully submitted,

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